

REMARKS

Claims 1-14 are currently pending in the present application.

The present invention is directed to compositions comprising fully or substantially hydrogenated block copolymers and various end-use applications thereof. The hydrogenated block copolymer is a rigid hydrogenated block copolymer, which comprises at least two distinct blocks of hydrogenated polymerized vinyl aromatic monomer, herein referred to as hydrogenated vinyl aromatic polymer blocks, and at least one block of hydrogenated polymerized conjugated diene monomer, herein referred to as hydrogenated conjugated diene polymer block, wherein the hydrogenated copolymer is further characterized by:

- a) a weight ratio of hydrogenated conjugated diene polymer block to hydrogenated vinyl aromatic polymer block of 40:60 or less;
- b) a total weight average molecular weight (M_w) of from 30,000 to 150,000, wherein each hydrogenated vinyl aromatic polymer block (A) has a M_w of from 6,000 to 60,000 and each hydrogenated conjugated diene polymer block (B) has a M_w of from 3,000 to 30,000; and
- c) a hydrogenation level such that each hydrogenated vinyl aromatic polymer block has a hydrogenation level of greater than 90 percent and each hydrogenated conjugated diene polymer block has a hydrogenation level of greater than 95 percent.

The Examiner states that the specification as filed has no support in any preceding cases including those on which applicants claim benefit of priority except for 09/575,062, specifically that applicants' number average molecular weights are not disclosed, mono or multilayer articles are not disclosed and applicants' ratio of diene/aromatic block is also not disclosed by any of the applications to which priority is claimed. The Examiner thus states that the effective filing date of the instant case is the filing date of 09/575,062, namely 5-19-00.

However, the Examiner is mistaken in that the specification is supported by previous filings and the claims have been amended such that support is found in the preceding cases. Specifically:

- 1) Claim 1 has been amended to an article which is a film, sheet, extruded profile, fiber, thermoformed article, coated article, rotational molded article, blow

molded article or pultruded article. Support for this amendment can be found on pg. 43, line 19, pg. 46, line 1, 13 and 20; pg. 47, line 11 and 19; pg. 48, line 1 and 24; pg. 49 line 11 and 20 and pg. 50, line 1. Support from previous cases for articles produced can be found on page 8 line 1 and 11; pg. 9, lines 1, 11 and 21; pg. 10, lines 12 and 23 of 60/139,074 filed on 6/11/99. Therefore, no new matter has been added.

2) Although the specification and original claims refer to a number average molecular weight (Mn), the paragraph spanning the bottom of page 6 to page 7 of the present specification contains the teaching:

“Number average molecular weight (Mn) and weight average molecular weight (Mw) can both be used to describe the polymers described herein. Because these polymers tend to have very narrow molecular weight polydispersities, the difference between Mn and Mw will be minimal. The ratio of Mw to Mn is typically 1.1 or less. In fact, in some cases the number average molecular weight and the number average molecular weight will be virtually the same. Therefore, Mn can also be read as Mw throughout this application.”

Therefore, the Mn terms in the claims can also be read as Mw terms according to the present specification. To avoid any doubt, the claims have been amended to read Mw instead of Mn. This is supported by the above cited paragraph of the present specification, therefore no new matter has been added. Support for the Mw can also be found in the provisional filing 60/139,074 filed on 6/11/99 throughout the specification and in Claim 1.

3) The ratio of diene/aromatic block is also disclosed in the provisional filing 60/139,074 filed on 6/11/99 specifically in Claim 1 of the provisional application:

1. A film produced from a hydrogenated block copolymer which comprises at least two distinct blocks of hydrogenated vinyl aromatic polymer, and at least one block of hydrogenated conjugated diene polymer, wherein the copolymer is characterized by:

- a) a weight ratio of hydrogenated conjugated diene polymer block to hydrogenated vinyl aromatic polymer block of 40:60 or less;
- b) a total weight average molecular weight (Mw) of from 30,000 to 150,000, wherein each hydrogenated vinyl aromatic polymer block (A) has a Mw_n of from 6,000 to 60,000 and each hydrogenated conjugated diene polymer block (B) has a Mw_n of from 3,000 to 30,000; and

c) a hydrogenation level such that each hydrogenated vinyl aromatic polymer block has a hydrogenation level of greater than 90 percent and each hydrogenated conjugated diene polymer block has a hydrogenation level of greater than 95 percent. Therefore, it has been shown that support for the present invention, specification and claims can be found in the provisional filing, filed on 6/11/99 and are therefore privileged to an effective filing date of June 11, 1999.

Claims 1-6 and 8-13 stand rejected under 35 U.S.C. 102(a) as anticipated by Fujiwara et al. (JP 11-286526). JP 11-286526 published on October 19, 1999 after the effective filing date of the present application (June 11, 1999) and therefore the invention was not known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent according to 102(a). Therefore, this rejection has been obviated.

Claims 3-7, 10-14 stand rejected under 35 U.S.C. 103(a) as unpatentable over Fujiwara et al., cited above in view of Ikematu (USP 5,189,110) or Hoeg (USP 3,598,886) obvious over Tanaka (JP 2725402). However, Fujiwara et al. has been removed as a reference, thus this rejection has also been obviated.

Claims 1-14 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Hoeg et al. (USP 3,598,886). The Examiner states that Hoeg et al. discloses styrene butadiene styrene block copolymers having applicants' level of aromatic block prior to hydrogenation. The Examiner notes Examples 72-87 in Table 2, Column 8 in this regard. The Examiner states that explicit amounts of butyl lithium and styrene/butadiene are disclosed such that a number average molecular weight of approximately 45,000 for these examples may be calculated.

However, the Examiner is mistaken in the calculation of the Mw's disclosed in Hoeg. In examples 72-87 of Hoeg, the total copolymer molecular weight is greater than 150,000. (See duplicated table from TABLE II (Column 8) of Hoeg, wherein the calculated molecular weight is listed in the last column, using the formula given in Column 6 of Hoeg.)

$$[\text{Molecular Weight} = \frac{\text{Grams M of monomer}}{\text{Moles of Catalyst}}]$$

Run No.	Designation	Styrene wt., g Block		Butadiene wt, g.	n-Butyl-lithium mM.	N sp/c.	Mw (X1000) (calculated)
		1st	2nd				
72	70SBS	18.9	18.2	15.5	0.18	1.33	292
73	70SBS	18.1	19.3	15.1	0.17	1.60	309
74	70SBS	18.7	19.0	15.0	0.17	1.60	310
75	70SBS	18.1	16.8	15.3	0.22	1.30	228
76	70SBS	18.1	16.8	15.1	0.22	1.35	227
77	70SBS	18.1	18.0	17.0	0.33	1.00	161
78	80SBS	22.9	20.2	10.9	0.33	1.08	164
79	80SBS	22.9	20.3	12.1	0.33	1.03	168
80	80SBS	22.9	19.6	11.8	0.33	1.01	164
81	80SBS	22.6	20.2	12.5	0.20	1.20	276
82	85SBS	22.2	20.7	7.6	0.17	1.00	297
83	85SBS	21.4	20.7	7.9	0.17	1.10	294
84	90SBS	24.6	24.2	5.7	0.21	1.34	260
85	90SBS	24.3	23.8	5.8	0.21	1.32	257
86	90SBS	24.5	24.6	5.5	0.23	1.25	237
87	90SBS	24.6	25.1	5.4	0.23	1.17	240

The present invention is limited to hydrogenated copolymers having a total Mw of 30,000 to 150,000. Hoeg has no copolymers of less than 161,000 Mw.

The Examiner states that while the number average molecular weights after hydrogenation are not disclosed, patentees' calculated number average molecular weights prior to hydrogenation are significantly above applicant's lower number average molecular weights, and that those of ordinary skill would therefore assume that the molecular weights after hydrogenation are within the metes and bounds of the molecular weights of the claims.

It is respectfully requested that the Examiner specifically point out what teaching he is relying on which would indicate that hydrogenating polymers of Mw 161,000 to 310,000 would give hydrogenated copolymers of 150,000 Mw or less. In fact, if the polymers of Table II were hydrogenated (hydrogenation begins in Example 5), the Mw's of the copolymers of Table II would increase, given that for each styrene repeat unit 6 H's are added and for each butadiene repeat unit 2 H's are added by the hydrogenation process. Therefore, Hoeg does not teach or suggest the compositions utilized in the articles of the present invention, nor does Hoeg teach or suggest such articles obtained therefrom. Therefore, this rejection has also been obviated.

Claims 1-6 and 8-13 stand rejected under 35 U.S.C. 102(b) as being anticipated by Kato (JP2586575). The Examiner states that Kato's Example 2 on pg. 14 discloses a SBS copolymer in which the styrene blocks are hydrogenated and which has a Mw of 60,000 and 5% butadiene and a disc produced therefrom.

Claim 1 has been limited to an article which is a film, sheet, extruded profile, fiber, thermoformed article, coated article, rotational molded article, blow molded

article or pultruded article. Therefore optical media discs are not included since they do not fall under any of the above categories. Kato only teaches an application of optical media discs. Therefore, the articles as now claimed are not anticipated by Kato and this rejection has been obviated.

Claims 3-6 and 8-13 stand rejected under 35 U.S.C. 103(a) as being anticipated by Kato (JP2586575). However, as stated previously, the amended claims of the present invention do not read on 'discs' produced from such compositions.

Additionally, the Examiner states that Kato's composition may not contain an additional polymer, but that the combination of block copolymer and homopolyvinyl cyclohexane would have been obvious to a practitioner in the expectation that such a combination would function as well, absent any showing of surprising or unexpected results. However, no where in Kato is any blend of polymers discussed or suggested. The examples specifically show homopolymer alone and a copolymer alone. There is no teaching or suggestion that since each can be used alone, they can also be interchanged for a blend of the two. Therefore, this rejection has been obviated.

Claims 1-14 stand rejected under 35 U.S.C. 102(e) as being anticipated by Hahnfeld (any one of U.S. Patents 6,451,924; 6,376,621; 6,426,390; 6,350,820).

The Examiner states that based upon the earlier effective U.S. filing date of the references, they constitute prior art under 35 U.S.C 102(e). However, as stated previously, the current application has an effective filing date of June 11, 1999 which is prior to any of the filing dates of the cited patents. Therefore, this rejection has been obviated.

Claims 1-14 stand rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over all claims of U.S. Patents 6,451,924; 6,376,621; 6,426,390; 6,350,820.

U.S. 6,451,924 (filed May 11, 2000) claims a composition having a weight ratio of 1,2 to 1,4 polybutadiene content of greater than 20:80. Therefore, this composition is patentably distinct from the composition utilized in the present application which has no such teaching or requirement. Additionally, the present application was filed previous to the filing date of the issued U.S. patent.

U.S. 6,376,621 (filed May 31, 2000) claims a composition comprising a hydrogenated isoprene polymer block and discs produced therefrom. Again, the composition is patentably distinct from the composition utilized in the present

invention, wherein the surprising and unexpected results of an isoprene polymer block copolymer were demonstrated. Additionally, optical media discs are not contemplated by the present claims of the present invention and the present application was filed previous to the filing date of the issued U.S. patent.

U.S. 6,426,390 (filed November 30, 2000) claims a composition having a soft segment phase volume such that lamellar morphology is achieved. This composition is again patentably distinct from the composition utilized in the applications of the present invention, in that no such morphology is taught or required by the claims of the present invention. Additionally, the present application was filed previous to the filing date of the issued U.S. patent.

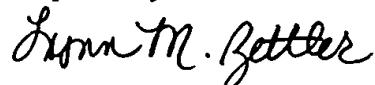
U.S. 6,350,820 (filed May 11, 2000) claims a composition wherein the hydrogenated conjugated diene polymer block has a polymer length of approximately 120 monomer units or less, which is patentably distinct from the composition utilized in the applications of the present invention. No such limitation is taught or required by the claims of the present invention. Optical media discs are not contemplated within the claims of the present application. Additionally, the present application was filed previous to the filing date of the issued U.S. patent.

Therefore, the double patenting rejection has been obviated.

The Examiner states that Applicants' Novel Heat Resistant Plastics From Hydrogenation of Styrene Polymers reference has not been considered since the date, journal of publication, author, etc. are not present on the IDS. Please note accompanied herewith an amended IDS for Polymer Preprints, 13 (1) pg. 427 1972.

Therefore, in light of the previous amendments and remarks above, allowance of claims 1-14 is respectfully requested.

Respectfully submitted,



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